

# PROJECT facts

U.S. DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY

Fuel Cells

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## SOLID STATE ENERGY CONVERSION ALLIANCE SOLID OXIDE FUEL CELL PROGRAM

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### Description

GE Hybrid Power Generation Systems (GE HPGS) will develop and demonstrate a modular 3- to 10/kW planar solid oxide fuel cell (SOFC) that operates on a variety of fuels and meets a wide range of power generation applications, as part of the SECA program. Using a low-cost manufacturing technique and cell design technology developed in related fuel cell projects, GE HPGS has developed a low-cost, high-performance, compact planar SOFC system, or power module, capable of 80% fuel utilization rates, operating at 800 °C; key aspects of achieving high fuel efficiency at a lower cost.

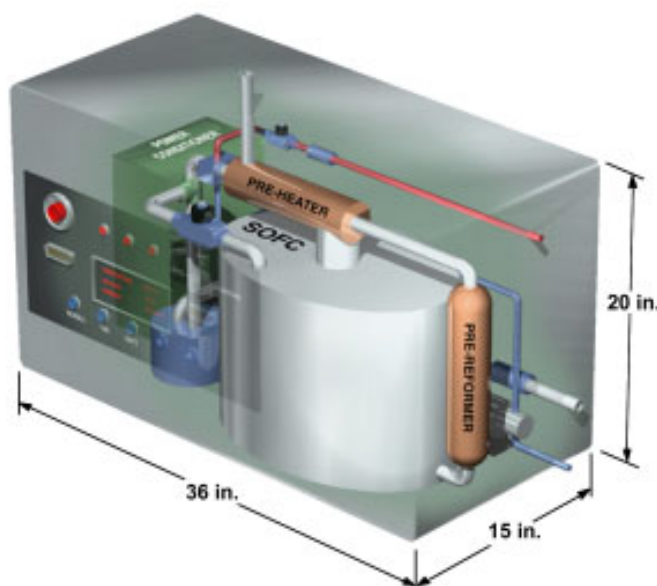


Figure 1. SOFC system concept

### Goals

Technological advances accelerate the solid oxide fuel cell to reaching commercial maturity. As part of the SECA program, GE HPGS is performing development and engineering work to produce a complete turnkey solid oxide fuel cell by 2005 with a demonstrated cost of \$800/kW. By 2010, GE HPGS work will reduce costs of the prototype to \$400/kW, achieving a complete turnkey solid oxide fuel cell system meeting SECA's cost reduction, and fossil fuel requirements.

PRIMARY PROJECT  
PARTNER

GE Hybrid Power Generation  
Systems  
Torrance, CA

COST SHARING

DOE               \$ 10,219,690  
Non-DOE       \$ 2,558,637

STRATEGIC CENTER  
FOR NATURAL GAS  
WEBSITE

www.netl.doe.gov/scng

CUSTOMER SERVICE

800-553-7681

Goals (continued)

Some of the technological advances of GE's SOFC are:

- An improved manufacturing process that produces thin-film electrolytes that operate at lower temperatures and thus reduce materials costs.
- An improved stack design concept that maximizes active cell area and minimizes sealing.
- The ability of the SOFC design to operate directly on light hydrocarbon fuels, and the use of a pre-reformer that can be operated as a catalytic partial oxidation or autothermal reforming processor to use different fuels.
- Integrated thermal management utilizes byproduct heat to increase overall efficiency.
- A flexible control structure for modifying and optimizing the system for various applications.

Benefits

The Solid State Energy Conversion Alliance (SECA) encourages the development of low cost, environmentally friendly solid-oxide fuel cell modules for use with commonly available fossil fuels. Participants in the SECA program include commercial developers, universities, government agencies, and other national laboratories to produce commercial, cost-effective environmentally friendly prototypes that are immediately applicable to a variety of applications.

GE's self-contained prototype will be able to operate on a variety of fuels. The modular design can be used as a small-scale, modular power system, or can be integrated into larger systems to suit the varying needs of commercial, industrial, and residential markets, such as hospitals, shopping centers, and apartment complexes to provide clean, affordable electricity to meet increasing demands.

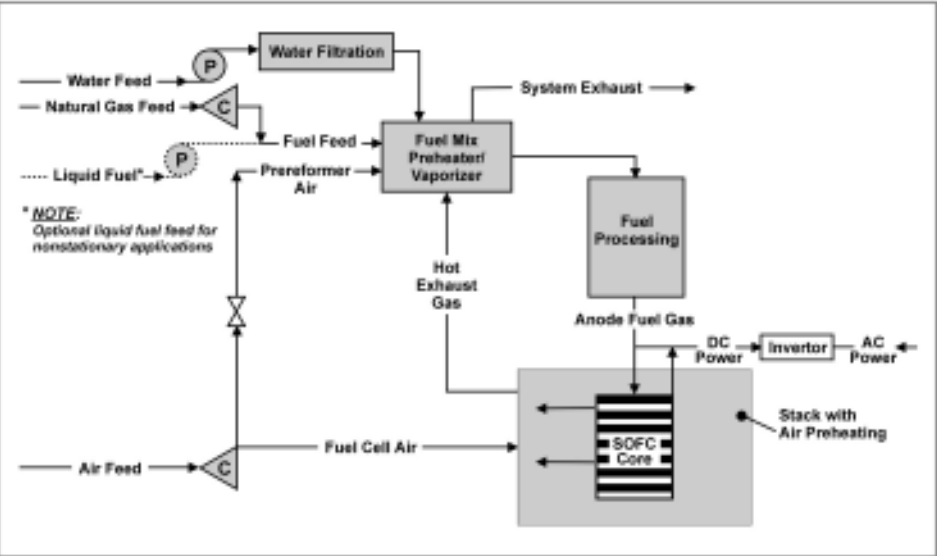


Figure 2. Preliminary conceptual system design

	Stationary	Mobile	Military
Fuel	Natural Gas	Gasoline	Diesel
Stack			
Voltage, V	0.75	0.75	0.75
Utilization	0.80	0.80	0.80
Power			
Fuel cell, kW	5.7	5.9	6.1
Net, kW	5.0	5.0	5.0
Efficiency			
Net, %	40	33	30

Figure 3. System performance estimates